

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1. – 21. (canceled).

22. (previously presented): A radio communications device comprising:

a transmitter comprising:

a plurality of transmission antennas for radiating radio waves based on transmission RF signals;
a plurality of transmitting circuit means for supplying the transmission RF signals to said plurality of the transmission antennas, respectively, based on a plurality of transmission signals; and

transmission signal processing means comprising modulating means, for modulating input transmission data to generate said plurality of the transmission signals by using said modulating means, and for outputting the modulated plurality of the transmission signals to said plurality of the transmitting circuit means;

a receiver comprising:

a plurality of reception antennas for receiving the radio waves transmitted by the plurality of the transmission antennas and outputting reception RF signals based on the received radio waves;

a plurality of receiving circuit means for outputting reception signals based on said reception RF signals output respectively by said plurality of the reception antennas; and

reception signal processing means comprising demodulating means, for demodulating the reception signals output respectively from said plurality of the receiving circuit means by using said demodulating means to generate reception data;

propagation detecting means for detecting a propagating state of said radio waves received by said plurality of the reception antennas; and

symbol rate setting means for selecting a symbol rate, to be used during modulation and demodulation, from a plurality of symbol rates based on the detected propagating state, and for setting the selected symbol rate in said modulating means and said demodulating means.

23. (previously presented): A radio communications device comprising:

a transmitter comprising:

a plurality of transmission antennas for radiating radio waves based on transmission RF signals;

a plurality of transmitting circuit means for supplying the transmission RF signals to said plurality of the transmission antennas, respectively, based on a plurality of transmission signals; and

transmission signal processing means comprising a plurality of modulating means having respective different modulating schemes, for modulating input transmission data to generate said plurality of the transmission signals by using a selected one of said plurality of the modulating means, and for outputting the transmission signals to said plurality of the transmitting circuit means;

a receiver comprising:

a plurality of reception antennas for receiving the radio waves transmitted by the plurality of the transmission antennas and outputting reception RF signals based on the received radio waves;

a plurality of receiving circuit means for outputting reception signals based on said reception RF signals output respectively by said plurality of the reception antennas; and
reception signal processing means comprising a plurality of demodulating means having respective different demodulation schemes, for demodulating the reception signals output respectively by said plurality of the receiving circuit means by using a selected one of said plurality of the demodulating means to generate reception data;

propagation detecting means for detecting a propagating state of said received radio waves; and

modulating means/demodulating means selecting means for selecting one of said modulating means and one of said demodulating means for modulating the input transmission data and for demodulating the reception signals, respectively, based on the detected propagating state.

24. (previously presented): The radio communications device according to claim 22, wherein said propagation detecting means detects the propagating state of said received radio waves according to at least one of the following: a reception electric power level of said received radio waves, a transmission error rate, a retransmission rate, or a channel matrix estimated in a spatial multiplexing process.

25. (previously presented): The radio communications device according to claim 23, wherein said propagation detecting means detects the propagating state of said received radio waves according to at least one of the following: a reception electric power level of said received radio waves, a transmission error rate, a retransmission rate, or a channel matrix estimated in a spatial multiplexing process.

26. (previously presented): The radio communications device according to claim 22, further comprising:

control means for instructing said symbol rate setting means to set a high symbol rate or a low symbol rate in said modulating means and said demodulating means based on the propagating state detected by said propagation detecting means.

27. (previously presented): The radio communications device according to claim 26, wherein said control means determines an intensity of multipath interference based on the propagating state of said received radio waves detected by said propagation detecting means, instructs said symbol rate setting means to set a high symbol rate in said modulating means and said demodulating means when it is determined that the intensity of the multipath interference is weak, and instructs said symbol rate setting means to set a low symbol rate in said modulating means and said demodulating means when it is determined that the intensity of the multipath interference is strong.

28. (previously presented): The radio communications device according to claim 23, further comprising:

control means for instructing said modulating means/demodulating means selecting means to select modulating means and demodulating means which have a high symbol rate or to select modulating means and demodulating means which have a low symbol rate based on the propagating state detected by said propagation detecting means.

29. (previously presented): The radio communications device according to claim 28, wherein said control means determines an intensity of multipath interference based on the propagating state of said received radio waves detected by said propagation detecting means, instructs said modulating means/demodulating means selecting means to select modulating means and demodulating means which have a high symbol rate when it is determined that the intensity of the multipath interference is weak, and instructs said modulating means/demodulating means selecting means to select modulating means and demodulating means which have a low symbol rate when it is determined that the intensity of the multipath interference is strong.

30. (previously presented): The radio communications device according to claim 26 or 27, further comprising:

means for lowering a multilevel modulation index used to modulate and demodulate the transmission data and the reception signals in said modulating means and said demodulating means, respectively, when said high symbol rate is set, and increasing the multilevel modulation index in said modulating means and said demodulating means, respectively, when said low symbol rate is set.

31. (previously presented): The radio communications device according to claim 28 or 29, further comprising:

means for lowering a multilevel modulation index used to modulate and demodulate the transmission data and the reception signals in said selected modulating means and said selected demodulating means, respectively, when said high symbol rate is selected, and increasing the multilevel modulation index in said selected modulating means and said selected demodulating means, respectively, when said low symbol rate is selected.

32. (previously presented): The radio communications device according to claim 26 or 27, wherein said transmission signal processing means and said reception signal processing means reduce a number of said plurality of the transmitting circuit means to be used and the number of said plurality of the receiving circuit means to be used when said high symbol rate is set, and increase the number of said plurality of the transmitting circuit means to be used and the number of said plurality of the receiving circuit means to be used when said low symbol rate is set.

33. (previously presented): The radio communications device according to claim 28 or 29, wherein said transmission signal processing means and said reception signal processing means reduce a number of said plurality of the transmitting circuit means to be used and the number of said plurality of the receiving circuit means to be used when said high symbol rate is selected, and increase the number of said plurality of the transmitting circuit means to be used and the number of said plurality of the receiving circuit means to be used when said low symbol rate is selected.

34. (previously presented): The radio communications device according to claim 27 or 29, wherein said control means instructs said transmission signal processing means and said reception signal processing means to use one of said plurality of transmitting circuit means and one of said plurality of receiving circuit means, respectively, when it is determined that the intensity of the multipath interference is weak, and instructs said transmission signal processing means and said reception signal processing means to use said plurality of transmitting circuit means and said plurality of receiving circuit means, respectively, when it is determined that the intensity of the multipath interference is strong.

35. (previously presented): The radio communications device according to claim 22 or 23, wherein said modulating means has modulation modes including a direct modulation mode for directly modulating said input transmission data into a transmission carrier and an indirect modulation mode for modulating said input transmission data into a transmission carrier after the input transmission data are processed, said demodulating means has demodulation modes including a direct demodulation mode for directly demodulating said reception signals to generate said reception data and an indirect demodulation mode for demodulating the reception signals and thereafter processing the demodulated reception signals to generate said reception data, said radio communications device further comprising modulation/demodulation mode selecting means for selecting and setting said modulation modes and said demodulation modes.

36. (previously presented): The radio communications device according to claim 35, wherein said control means instructs said modulating means and said demodulating means to use

said direct modulation mode and said direct demodulation mode, respectively, when it is determined that the intensity of the multipath interference is weak, and instructs said modulating means and said demodulating means to use said indirect modulation mode and said indirect demodulation mode, respectively, when it is determined that the intensity of the multipath interference is strong.

37. (previously presented): The radio communications device according to claim 34, wherein said control means instructs said modulating means and said demodulating means to select any one of modulating and demodulating processes including ASK, BPSK, FSK, QPSK, and DQPSK for modulating and demodulating the transmission data and the reception signals, respectively, and to use one of said plurality of transmitting circuit means and one of said plurality of receiving circuit means, respectively, when it is determined that the intensity of the multipath interference is weak, and instructs said modulating means and said demodulating means to select either of modulating and demodulating processes including OFDM with multilevel PSK or multilevel QAM as a primary modulation for modulating and demodulating the transmission data and the reception signals, respectively, and to use said plurality of transmitting circuit means and said plurality of receiving circuit means, respectively, when it is determined that the intensity of the multipath interference is strong.

38. (previously presented): The radio communications device according to claim 32, further comprising:

power supply control means for controlling power supplies of said plurality of transmitting circuit means and said plurality of receiving circuit means, respectively, to stop

supplying electric power to the transmitting circuit means and the receiving circuit means which are not in use.

39. (previously presented): The radio communications device according to claim 22, wherein said plurality of the transmission antennas and said plurality of the reception antennas are shared.

40. (previously presented): The radio communications device as in any one of claims 22, 27, and 29, wherein said radio waves radiated by said plurality of the transmission antennas have a frequency of 10 GHz or higher.

41. (previously presented): A radio transmitter comprising:
a plurality of transmission antennas for radiating radio waves based on RF signals;
a plurality of transmitting circuit means for supplying the RF signals to said plurality of the transmission antennas, respectively, based on a plurality of transmission signals;
transmission signal processing means comprising modulating means, for modulating input transmission data to generate said plurality of the transmission signals by using said modulating means, and for outputting the plurality of the transmission signals to said plurality of the transmitting circuit means; and

symbol rate setting means for selecting a symbol rate, to be used by the modulating means to modulate the input transmission data, from a plurality of symbol rates based on a detected propagating state of said radio waves, and for setting the selected symbol rate in said modulating means.

42. (previously presented): A radio receiver comprising:

a plurality of reception antennas for receiving radio waves from a transmitter and outputting reception RF signals;

a plurality of receiving circuit means for outputting reception signals based on said reception RF signals output respectively by said plurality of the reception antennas;

reception signal processing means comprising demodulating means, for demodulating the reception signals output respectively by said plurality of the receiving circuit means by using said demodulating means to generate reception data; and

symbol rate setting means for selecting a symbol rate, to be used by said demodulator to demodulate the reception signals, from a plurality of symbol rates based on a detected propagating state of said radio waves, and for setting the selected symbol rate in said demodulating means.

43. (previously presented): A radio transmitter comprising:

a plurality of transmission antennas for radiating radio waves based on RF signals;

a plurality of transmitting circuit means for supplying the RF signals to said plurality of the transmission antennas, respectively, based on a plurality of transmission signals;

transmission signal processing means comprising a plurality of modulating means having respective different modulating schemes, for modulating input transmission data to generate said plurality of the transmission signals by using a selected one of said plurality of the modulating means, and for outputting the transmission signals to said plurality of the transmitting circuit means; and

modulating means selecting means for selecting one of said modulating means to be used for modulating the input transmission data based on a detected propagating state of said radio waves.

44. (previously presented): A radio receiver comprising:
a plurality of reception antennas for receiving radio waves from a transmitter and outputting reception RF signals;
a plurality of receiving circuit means for outputting reception signals based on said reception RF signals output respectively by said plurality of the reception antennas;
reception signal processing means comprising a plurality of demodulating means having respective different demodulating schemes, for demodulating the reception signals output respectively by said plurality of the receiving circuit means by using a selected one of said plurality of the demodulating means to generate reception data; and
demodulating means selecting means for selecting one of said demodulating means to be used for demodulating the reception signals based on a detected propagating state of said radio waves.

45. (previously presented): The radio communications device of claim 22, wherein the propagation detecting means receives as input a channel matrix based on the reception signals, a reception level of the reception signals, and a bit error rate of the reception signals, and detects the propagating state of the received radio waves based on the received input.

46. (previously presented): The radio communications device of claim 23, wherein the propagation detecting means receives as input a channel matrix based on the reception signals, a reception level of the reception signals, and a bit error rate of the reception signals, and detects the propagating state of the received radio waves based on the received input.

47. (canceled).

48. (previously presented): The radio receiver of claim 42, further comprising:
propagation detecting means for detecting the propagating state of said radio waves received by said plurality of the reception antennas,
wherein the propagation detecting means receives as input a channel matrix based on the reception signals, a reception level of the reception signals, and a bit error rate of the reception signals, and detects the propagating state of the received radio waves based on the received input.

49. (previously presented): A radio communications device comprising:
a transmitter comprising:
a plurality of transmission antennas for radiating radio waves based on transmission RF signals;
a plurality of transmitting circuits for supplying the transmission RF signals to said plurality of the transmission antennas, respectively, based on a plurality of transmission signals; and

a transmission signal processing circuit comprising a modulator, for modulating input transmission data to generate said plurality of the transmission signals by using said modulator, and for outputting the modulated plurality of the transmission signals to said plurality of the transmitting circuits;

a receiver comprising:

a plurality of reception antennas for receiving the radio waves transmitted by the plurality of the transmission antennas and outputting reception RF signals based on the received radio waves;

a plurality of receiving circuits for outputting reception signals based on said reception RF signals output respectively by said plurality of the reception antennas; and

a reception signal processing circuit comprising a demodulator, for demodulating the reception signals output respectively from said plurality of the receiving circuits by using said demodulator to generate reception data;

a propagation detecting circuit for detecting a propagating state of said radio waves received by said plurality of the reception antennas; and

a symbol rate setting circuit for selecting a symbol rate, to be used during modulation and demodulation, from a plurality of symbol rates based on the detected propagating state, and for setting the selected symbol rate in said modulator and said demodulator.

50. (previously presented): A radio receiver comprising:

a plurality of reception antennas for receiving radio waves from a transmitter and outputting reception RF signals;

a plurality of receiving circuits for outputting reception signals based on said reception RF signals output respectively by said plurality of the reception antennas;
a reception signal processing circuit comprising a demodulator, for demodulating the reception signals output respectively by said plurality of the receiving circuits by using said demodulator to generate reception data; and
a symbol rate setting circuit for selecting a symbol rate, to be used by said demodulator to demodulate the reception signals, from a plurality of symbol rates based on a detected propagating state of said radio waves, and for setting the selected symbol rate in said demodulator.

51. (new): A radio communication device comprising:
a plurality of modulating means for modulating transmission data to generate a plurality of transmission signals;
a plurality of transmission means for supplying, based on said plurality of transmission signals, transmission RF signals to a plurality of transmission antennas, wherein said plurality of transmission antennas radiate radio waves based on the transmission RF signals; and
a plurality of demodulating means for demodulating reception signals based on reception RF signals output from reception antennas that have received the radio waves from the plurality of the transmission antennas, to generate reception data, wherein the reception antennas output the reception RF signals based on the received radio waves,
wherein a first symbol rate in said plurality of modulating means and a second symbol rate in said plurality of demodulating means are set based on an intensity of the multipath interference which is determined based on a propagating state of the radio waves.